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THE DEVELOPMENT OF CHEMICAL THEORY.

A History of Chemical Theory and Laws. By M. M. Pattison Muir. Pp. xx+555. (New York: John Wiley and Sons; London: Chapman and Hall, Ltd., 1907.) Price 17s. net.

THIS book, as the author remarks in several places, is not intended as a history of chemistry, but as an account of the development of chemical theory, an account of attempts "to describe, to set in due order, and to connect the changes of composition and the changes of properties which occur simultaneously in systems of homogeneous substances, and the conditions under which these changes proceed." Or, as the author again expresses his intention, it is "to trace the forms which the two fundamental inquiries of chemistry have presented at different periods, to describe some of the methods which have been used to find answers to these inquiries, and to set forth the general results of the application of these methods." The two fundamental inquiries relate to the questions, "What is a chemically distinct substance?" and "What happens when chemically distinct substances interact?"

These questions are treated historically. In answer to the first, the author deals with the "recognition of homogeneous substances, and the description of chemical changes as the interactions of those substances; the marks of elements and compounds; the laws of chemical combination, the atomic hypothesis, the molecular and atomic theory; the composition of homogeneous substances—allotropy; elements which do not react; and chemical nomenclature and classification." In answer to the second question, an account is given of "the classification of homogeneous substances; acids, bases and salts; radicals, types, dualism, the unitary hypothesis; chemical equivalency; isomerism and constitutional formulæ; the hypothesis of ionisation; the periodic law; the conditions and laws of chemical change; chemical affinity; chemical equilibrium; and lastly, the elucidation of chemical reactions by measurements of physical properties."

In pursuit of this plan, the author treats first of ancient conceptions up to the year 1780; Lavoisier's systematisation is next considered; then follows a historical sketch of the doctrine of atoms, leading to the differentiation of the atom and the molecule. An account of more modern work is here introduced, in which the van 't Hoff-Arrhenius extension of gaseous laws to dilute solutions is gone into in some detail; and the conception of a molecule having been developed, allotropy is treated of as due to molecular complexity or arrangement. The inert gases of the argon group are next mentioned, and in an appendix chemical nomenclature and notation.

In the second part of his book Mr. Muir discusses the classification of substances into acids, bases, and

salts; he describes the development of the theory of types and radicals, leading to chemical equivalency; and he extends these conceptions to cover the field of molecular structure, dealing with isomerism and constitutional formulæ.

The next section treats of ionisation; then follows a short account of the periodic classification. In a third section the subjects considered are chemical affinity; chemical equilibrium; the relations between the physical properties of substances and their chemical reactions, as exemplified by their optical properties and their thermal behaviour.

These subjects are illustrated by suitable extracts from the works of the investigators who forwarded the theories. Quotations from Boyle, Priestley, and Lavoisier give an idea of these authors' styles, and render clear the subject-matter which is under discussion. To give an instance:—

"To-day it is possible to recognise a certain resemblance between the saying of Stephanus of Alexandria (about 620), 'it is necessary to deprive matter of its properties in order to draw out its soul,' and the statement of Lavoisier (1789) that the object of chemistry is 'to decompose the different natural bodies . . . and to examine separately the different substances which enter into their combination.' The first statement rested on a sweeping and superficial glance over an intricate maze of occurrences, and it produced little accurate knowledge. The second statement was a result of the penetrating study of a few detached events; it was a translation of the first statement into expressions which could be directly applied to a vast number of particular phenomena, and in a few years it produced a science."

So far as possible the authors alluded to tell their own stories, and the reader's attention is directed by Mr. Muir to the salient points in their conclusions.

It is better, on the whole, to treat chemical science as Mr. Muir has treated it, in following out the history of the development of each idea, so far as that is possible, than to attempt a chronological history; the one is the philosophy of history, the other is apt to be overburdened with unconnected detail. A third plan is the biographical one; to select certain chemists who have contributed to the advancement of their science, and to show, by an account of the life-work of each, how far discovery has been furthered. There are difficulties in all methods of treatment; probably the one chosen by Mr. Muir tends most towards lucidity.

In his preface, Mr. Muir writes:—

"Some may say I have omitted much that is important, others may think I have included not a little that is trivial. In such matters a writer must use his own judgment, after he has trained it to the best of his ability."

And at the beginning of the chapter on chemical equilibrium, he says:—

"He who would describe in detail the historical development of chemical equilibrium must be a chemist, a physicist, and a mathematician; he must be a man of great learning, vast audacity, and much literary ability."

In his own judgment Mr. Muir is quite unable to attempt the task; but his estimate is too modest. It must certainly be acknowledged that he has displayed great learning and much literary ability. As to the audacity, it is for himself to judge. W. R.

NIGER DELTA NEGROES.

The Lower Niger and its Tribes. By Major Arthur Glyn Leonard. Pp. xxii+564. (London: Macmillan and Co., Ltd.) Price 12s. 6d. net.

THERE is about this book, which is undeniably interesting, a certain haziness in its preliminary observations, a lack of sharpness in its detail, in the geography and natural history, which suggests a photograph slightly out of focus. You get a general idea of the scene, but you cannot be quite sure as to the species of the trees or flowers, or whether it is horses or cows that are feeding in the distant fields. This want of exactitude is probably due to the fact that the author has seemingly allowed several years to elapse since his departure from the Niger delta before transcribing his remembrances from his notes.

The book, in its good features and in its faults, is a rather striking example of the new school of literature dealing with negro Africa which has arisen since the publication of Mary Kingsley's West African studies. This remarkable woman founded a new school in African studies which in some directions—politically more especially—has wrought much good. In convincing the British white man—official, missionary, or merchant—that the black is not the half-animal savage which many unthinking people had considered him to be, that there is much good in his native ideas of religion and social economy, Mary Kingsley came near to being a genius, for she grasped and expressed many truths about the negro of West Africa which had been perceived by those who did not write or speak, and had been overlooked by many who did both. Her gift of intuition enabled her to arrive at these conceptions with very little help from language. In her two or three years spent on the West Coast of Africa she never mastered a sentence in any African language, and all her inquiries were conducted through English-speaking interpreters. Those, therefore, who have had more scientific training in the affairs of Africa cannot always bring themselves to agree with Miss Kingsley's statements or with the deductions drawn therefrom; but she carries conviction in so much of her work that it is not necessary to attack it as a whole. In a journal of exact knowledge like *NATURE* it is as well, however, to put ethnologists on their guard, to demand the utmost precision of statement from new writers on African subjects, even perhaps to beg of those writers to furnish an array of accurate and useful facts and not attempt to add their own deductions, which may be based on a very limited knowledge either of Africa or the human race in general.

Miss Kingsley's disciples are too fond of coining words in "ism" and "ality," and out of these they create a windy philosophy of German nineteenth-

century type which they then declare to be the true meaning of African religious ideas. In one book—not that under review—much of this philosophy is based on a series of sentences in a native language, the words for which, though correctly taken down, are followed by a translation which is often incorrect and misleading. Major Leonard in one chapter has cited a number of interesting proverbs and several fables, but he does not tell us from which tribe each is drawn, and his work would have carried more conviction if he had given the actual rendering in the native language, so that specialists could have satisfied themselves as to the correctness of the translation.

There is a good deal more accuracy and definiteness in the way the author traces the history of the Ibo and Jekri and Efik peoples, and he imparts much useful and novel information regarding the Ijo tribe, which, not differing physically from the other negro inhabitants of the Niger delta, nevertheless possesses a language of very isolated type with no clear relationships. The descriptions of the native gods and the spirits who are believed to exist in trees, earth, water, and sky are valuable, and, so far as the reviewer can judge, accurate; moreover, they are given in a manner and style certain to arrest and retain the reader's interest. "Horrors" are dealt with in sober language, but some of the incidents cited might be the nucleus of powerful stories such as Grant Allen used to write. To those writers of fiction who place their stories in Africa, Major Leonard's book will supply many a sensational episode, while at the same time keeping within the limits of actual fact.

Much interesting matter is also included dealing with the languages of the Niger delta and of Old Calabar. The reviewer, however, cannot quite endorse Major Leonard's theories as to etymology and the inter-relationship of certain language groups, but these theories are presented without dogmatism, and are worth consideration.

The book is therefore interesting, and more than half of it consists of a well-presented statement of the religious beliefs, manners, and customs of the Ibo people more especially, and also of the Ijo, Jekri, Efik, and Ibibio. If Major Leonard could have omitted some of the preliminary chapters dealing too much with speculative philosophy and have confined himself to the interesting statement of his own personal observations, he would have produced a work of compact value. Even as it is, those engaged in African research will find it an excellent guide in studying the negroes of the Niger delta.

H. H. J.

PRACTICAL PLANT-PHYSIOLOGY.

Vorschule der Pflanzenphysiologie, eine experimentelle Einführung in das Leben der Pflanzen. By Prof. L. Linsbauer and Dr. K. Linsbauer. Pp. xiv+255. (Vienna: Carl Konegen, 1906.)

THIS book consists of instructions for the performance of 295 experiments in plant physiology in the widest sense. It includes, not only the physiology of nutrition and movement, but also a